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OPERATOR'S POSITION CIRCUIT

Filed May 15, 1940

3 Sheets-Sheet 1

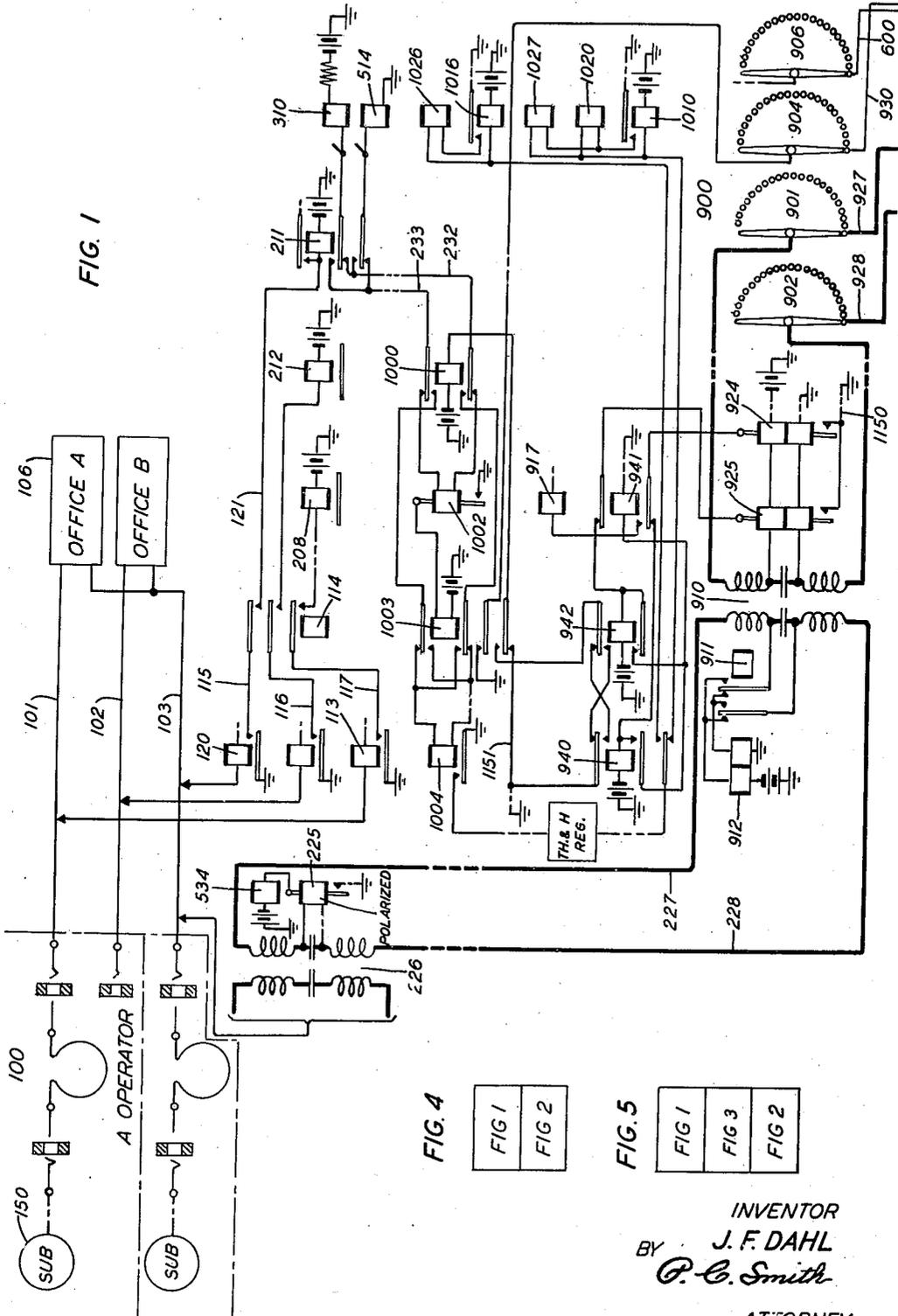


FIG. 1

FIG. 4

FIG. 1
FIG. 2

FIG. 5

FIG. 1
FIG. 3
FIG. 2

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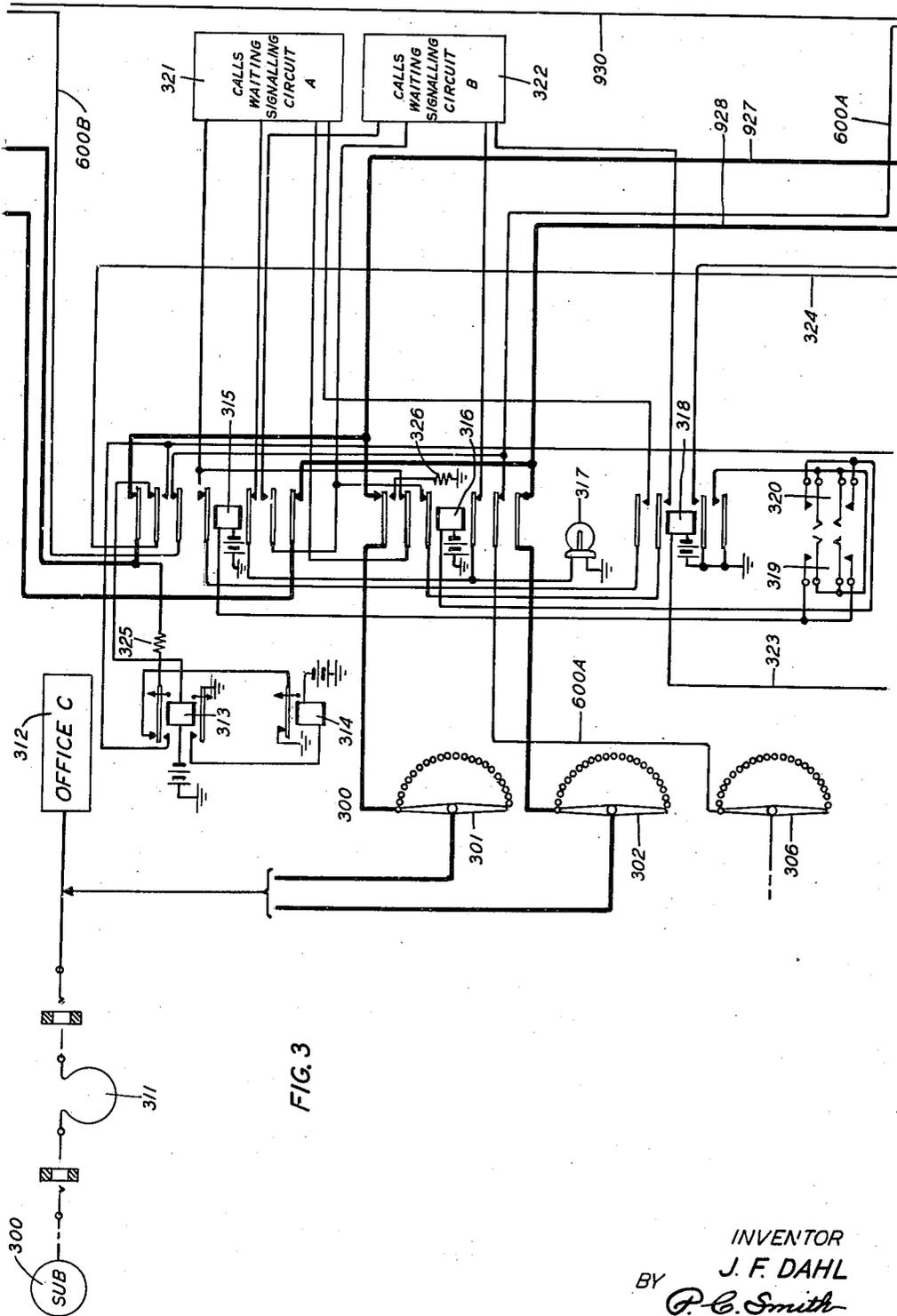


FIG. 3

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# UNITED STATES PATENT OFFICE

2,259,100

## OPERATOR'S POSITION CIRCUIT

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Application May 15, 1940; Serial No. 335,245

8 Claims. (Cl. 179-27)

This invention relates to telephone systems and has for its object to facilitate the handling of calls requiring the services of an operator.

In certain exchange areas it has proved convenient to terminate the lines of a plurality of offices in one building and to make the control equipment common to the offices. In such an installation there will be groups of junctors incoming individually to each office and, where convenient, groups of junctors incoming to a plurality of offices. Such groups of junctors establish an indication of the office to which they are connected in the common control equipment.

Calls incoming from a manual operator's position are directed to a B operator's position and, in accordance with the present invention, where the incoming trunks or junctors have access to more than one office, means is provided to inform the calling operator that the office designation is required. The B operator is also provided with means for indicating to the sender to which of the offices the call is to be directed.

More specifically, during the connection of the incoming junctor and the terminating sender, a group circuit in the link control circuit sets up an indication which shows whether the calling junctor has access to one or more than one office and, in the former case, gives the identity of the office. If the junctor serves a plurality of offices, this information modifies the operation of the tone generation at the operator's position to inform the originating operator that the office identity should be given. The B operator receiving this information gives a discriminating indication to the sender to control the marker to make selections in the proper office.

Where there are large groups of incoming trunks, the groups may be served by individual groups of senders which have access to the operators' positions in common. In such a case, means is provided to render an operator's position unavailable to one group of senders when desired. Means is also provided to give a re-order signal to any sender of that group which may have just seized the position.

These and other features of the invention will be more apparent from a consideration of the following description in connection with the drawings, in which:

Fig. 1 shows, in skeletonized form, calling lines, A operators' cord circuits, three incoming junctors and a sender;

Fig. 2 shows a B operator's position circuit;

Fig. 3 shows a second incoming connection and the position grouping circuit; and

Figs. 4 and 5 show alternative methods of arranging the other figures.

The sender and position circuit of Figs. 1 and 2 form parts of the disclosure of the copending application of R. C. Davis et al., Serial No. 335,240, filed May 15, 1940, to which reference is made for a complete description of the sender. In general, the reference numerals used in Figs. 1 and 2 of the present application are the same as those of the copending application.

Referring first to the arrangement of Fig. 4 in this disclosure, three junctors 101, 102 and 103 are shown, junctor 101 terminating in office A, junctor 102 in office B and junctor 103 in both offices. When an A operator seizes one of these junctors, the incoming link control circuit (not shown) connects the junctor with the terminating end of a sender. In the control circuit a group relay, such as relay 113, 120, etc., is operated to ground one of conductors 115, 116 or 117 and operate a relay in the sender indicative of the office at which the junctor terminates. Relay 208 is operated when the junctor terminates at office A, relay 212 for office B and relay 211 for junctors which are common to both offices.

The B sender is divided into two sections connected together by two pairs of conductors, namely, a talking circuit and a fundamental circuit. One section is located at a centralized office and has a position finder 900 by means of which it has access to the B operator's position of Fig. 2. The centralized sender also has a set of registers which are positioned under the control of the B operator. The other section is located at the terminating office, receives the designation from the centralized sender and controls a marker which in turn controls the establishment of the wanted connection.

Assuming first that a call is originated over junctor 101 for a subscriber at office A, relay 113 will be operated. When the sender has been seized, relay 208 is operated and the circuits connecting the terminating sender to the centralized sender are established. The circuit over the talking conductors extends from battery through the left winding of relay 912, outer back contact of relay 911, lower left winding of repeating coil 910, conductor 228, lower right winding of repeating coil 226, through the winding of relay 225, upper right winding of coil 226, conductor 227, upper left winding of coil 910, inner back contact of relay 911 to ground through

the right winding of relay 912. The fundamental circuit extends from battery through the winding of relay 310, inner back contact of relay 211, conductor 232, lower back contact of relay 1000, winding of relay 1002, upper back contact of relay 1000, conductor 233, outer back contact of relay 211 to ground through the winding of relay 514. This latter circuit is ineffective at this time. The operation of relay 912 starts the position finder 900 hunting for an idle B operator's position.

When a position such as the position of Fig. 2 is occupied, the insertion of the plug of the operator's headset 605 in the position jack 606 closes a circuit from battery through the right winding of relay 604, through the plug and jack connection and the transmitter of the headset to ground through the left winding of relay 604. Relay 604 operates, connecting battery over its inner left contact, conductor 612, left normal contact of key 603, left back contact of relay 602, resistance 601 to conductor 600, which is connected to one of the terminals engaged by position finder brush 906.

As soon as the position is found, the position finder is brought to rest and battery through a relay is connected to conductor 922 for operating relay 608. Relay 608 closes a circuit from battery over the inner left front contact of relay 604, conductor 612, contact of relay 608 through lamp 609 to ground through interrupter 610 to warn the operator that her position has been seized. In the sender a relay, operated as a result of finding the position, connects the outer ends of the right windings of repeating coil 910, over brushes 901 and 902 and conductors 927 and 928 to the position circuit. The inner end of the upper right winding of coil 910 is connected through the upper windings of polarized relays 924 and 925 to battery while the inner end of the lower right winding of coil 910 is connected through the lower windings of relays 924 and 925 to ground.

In the position circuit conductor 927 is connected through the windings of relay 611 to conductor 928. Therefore, relay 611 operates and at its right contact extends conductor 928 over the outer right back contact of relay 613 to the secondary winding of tone coil 614. Conductor 927 is connected through condenser 615 over the outer left back contact of relay 613 to the other side of the secondary winding of tone coil 614. Relay 611 at its left contact closes a circuit from battery on conductor 612 to the winding of relay 629 and ground. Relay 629 operates and closes a circuit from tone source 616, outer right front contact of relay 629, left back contact of relay 617, right back contact of relay 618, primary winding of tone coil 614 to ground at the inner right back contact of relay 613, thereby transmitting a tone over the conductors 927 and 928, brushes 901 and 902, through repeating coil 910, conductors 227 and 228, through repeating coil 226, and thence to the position of the A operator. The B operator may also hear the tone transmitted to her headset receiver through condensers 620 and 621.

Relay 629 also closes an obvious circuit for relay 607 and completes a circuit for relay 619 which may be traced from battery through the winding of relay 619, right back contact of relay 617, conductor 622, outer left contact of relay 629, to ground at the outer right front contact of relay 604. Relay 607 disconnects conductor 922 from the winding of relay 608 permitting re-

lay 608 to release and disconnect battery from lamp 609. With relays 629 and 607 operated a circuit is closed from battery through the winding of relay 618, right front contact of relay 607, inner left back contact of relay 613, to grounded conductor 622. Relay 618 is slow to operate and, after an interval, opens the circuit through the primary winding of tone coil 614, thereby interrupting the tone. Relay 618 closes a circuit from battery through the left winding of relay 602, left front contact of relay 618 to ground on conductor 622. Relay 602 locks through its right winding and inner right front contact to ground at the inner left contact of relay 629 and extends its operating ground to the winding of relay 623. In addition, relay 602 reconnects battery to lamp 609 over the outer left front contact of relay 602, left normal contact of key 603 and conductor 612. Relay 623 operates and recloses the primary circuit of tone coil 614 which now extends over the right front contact of relay 618 and the outer left front contact of relay 623 instead of over the back contact of relay 618. A second tone is, therefore, transmitted to the A operator. Relay 623 also closes a circuit from ground on conductor 622, inner contact of relay 623 to the winding of relay 617 and battery. Relay 617 is also slow to operate and after an interval again opens the primary circuit of the tone coil to interrupt the second impulse of tone. In addition, relay 617 closes a circuit from ground on conductor 622, right front contact of relay 617, left back contact of relay 624 to the winding of relay 613 and battery. Relay 613 locks over its left alternate contact to ground on conductor 622, short-circuits condensers 620 and 621 and connects ground over its right alternate contacts to lamp 609 in shunt of interrupter 610 whereby lamp 609 glows steadily to inform the operator that her headset has been connected to the A operator's position.

The A operator then passes the wanted number to the B operator and the B operator operates the keys of her key-set to record the number given.

When the number has been recorded, relay 1000 is operated to substitute stepping relay 1004 for polarized relay 1002 and to prepare for the transfer of the designation to the terminating sender.

When a call comes in over a junctor 102 leading to office B, relay 212 operates, which gives a different indication to the marker but does not affect the operation of the position circuit.

When a call comes in over junctor 103 leading to both offices, relay 211 is operated. With relay 211 operated the connection of battery and ground to the fundamental circuit is reversed and relay 1002 in the centralized sender operates, in turn operating relay 1003. Relay 1003 reverses the connection of stepping relay 1004 to the contacts of relay 1000 to compensate for the reversal by relay 211. Relay 1003 also connects ground over its middle lower front contact, brush 904, conductor 930, right back contact of relay 602 to the left winding of relay 624 and battery. Relay 624 locks in a circuit from battery through its right winding and inner right front contact to ground at the inner left front contact of relay 629 and completes the circuit of lamp 655 to indicate that the incoming call requires an office indication.

When relay 629 operates, the primary circuit of the tone coil extends from source 616, outer right front contact of relay 629, left back contact of

relay 617, outer right front contact of relay 624, primary winding of coil 614 to ground at the inner right back contact of relay 613. As before, relay 629 operates relays 607 and 619, in turn operating relay 618 but the tone circuit is held closed over the contacts of relays 624 and 619 in shunt of the contact of relay 618. Relay 618 operates relay 602 which in turn operates relay 623. Relay 623 operates relay 617 which opens the circuit of relay 619. Relay 619 releases after an interval, and opens the circuit of the tone coil and stops the tone. With relay 602 operated, the previously traced circuit for relay 613 is open, but the release of relay 619 closes a substitute circuit over the back contact of relay 619 and the front contact of relay 617 to conductor 522. Therefore, the A and B operators hear a single prolonged tone to inform them that the office designation is to be given.

When the B operator receives the office name, she operates one of the keys 651 or 652 according to the identity of the wanted office. Key 651, corresponding to office A, connects battery over conductor 612 through resistance 653, through the two windings of relay 611 in parallel to conductors 927 and 928. These conductors are connected as previously traced through the windings of polarized relays 924 and 925. With battery connected to conductors 927 and 928, relay 925 operates, closing a circuit from ground on conductor 1150, contact of relay 925, upper back contact of relay 941 to the winding of relay 942 and battery. Relay 942 in operating locks over its lower front contact through the winding of relay 941 to ground. With relay 1003 operated, relay 1000 cannot operate until the office registration has been made, since the circuit of relay 1000 now extends from battery through the winding of that relay, outer lower front contact of relay 1003, upper front contact of relay 942 and the upper back contact of relay 940 to ground over conductor 1151.

If key 652, corresponding to office B, is operated it connects ground to conductors 927 and 928, and relay 924 operates, in turn operating relay 940. Relay 940 also locks through the winding of relay 941 and closes the operating circuit for relay 1000. In addition, during incoming group selection, the counting relay circuit is modified by the operation of relay 940. The pulsing circuit extends from the contact of stepping relay 1004 through the thousands and hundreds registers to the counting relays which operate successively until the No. 1 counting relay has been operated. With relay 940 normal the circuit is extended over the lower back contact of relay 940 to the No. 0 counting relay 1010 which locks through relays 1020 and 1027, the latter relays terminating the pulsing. With relay 940 operated the counting circuit extends over the front contact of relay 940 to the winding of the No. 6 counting relay 1016. As shown in detail in the Davis et al. application, this causes five additional pulses to be transmitted, in turn causing the sender to transmit to the marker an indication which in combination with that set up by relay 211, tells the marker to select the line in office B.

If the position does not function properly, the operator may operate key 603, connecting ground over the inner right operated contact of key 603, outer right front contact of relay 613, through the right front contact of relay 611 to conductor 928 and through the windings of relay 611 to conductor 927, operating relay 924 as when key

652 was operated. If an office registration has been made, so that relay 941 is operated, the operation of relay 924 completes a circuit for reorder relay 917 which controls the transmission of a reorder signal as described in the Davis et al. application.

Referring now to the arrangement of Fig. 5, Fig. 3 is inserted between Figs. 1 and 2. This arrangement finds use where one set of B operators serves more than one installation, one of which includes a single office served by senders equipped for receiving only the numerical designation and another which includes two offices served by common senders which may receive an office indication. Under heavy traffic conditions, efficiency is promoted by setting aside certain operators to handle the calls from the single office installation.

For such an arrangement, the equipment of Fig. 3 is provided at each operator's position. With the circuits of Fig. 3 normal, the test conductor 600 and the talking conductors 928 and 927 are extended in parallel over the back contacts of relay 315 to terminals in the banks of brushes 906, 901 and 902 of the double office unit and over the back contacts of relay 316 to contacts of brushes 306, 301 and 302 of position finder 300 associated with the single office unit C. Therefore, the operator's position of Fig. 2 is normally accessible to all position finders.

In this modified arrangement there are calls waiting signal circuits 321 and 322 associated with each unit in place of the single circuit 657, and battery connected to conductor 656 by relay 604 is connected to conductor 323, operating relay 318 which, in combination with relays 315 and 316, closes circuits in the signal circuits 321 and 322 to indicate that the position is occupied and is serving both units. In addition, relay 318 supplies ground to the outer left armature of relay 629, while the ground formerly closed to that armature is extended over conductor 324, third upper back contact of relay 315, winding of relay 313 and battery. Relay 313 in turn operates relay 314.

With the circuits in this condition, the functioning of the position is as described. If it is desired to limit the calls incoming to this position to those from unit C, key 319 will be operated, closing a circuit from ground over the lower front contact of relay 318, contacts of key 319, winding of relay 315 and battery. Relay 315 disconnects the position circuit from the banks associated with brushes 901, 902 and 906 and from the banks of other finders of the corresponding unit. It opens the circuit to the signal circuit 321 and closes an additional circuit to signal circuit 322 to indicate that the position is now serving only unit C. It also disconnects lamp 317 from signal circuit 321.

At its third upper armature, relay 315 closes a circuit from brush 901, through resistance 325, upper front contact of relay 313, upper front contact of relay 315, to ground over conductor 324. It also opens the circuit of relay 313 which releases slowly, followed by relay 314 which also releases slowly. When relay 313 releases, it opens the above-traced circuit but when relay 314 releases the circuit is reclosed over the back contacts of relays 314 and 313. If one of the position finders, such as finder 900, had just selected this position at the time key 319 was operated, the circuit would extend through the upper windings of relays 925 and 924, causing the successive operation of relays 941 and 917 to

transmit a reorder signal to the originating operator.

If this position is to serve only calls in the double office unit, key 320 is operated, operating relay 316. Relay 316 disconnects the position from position finder 300, rearranges the circuits of the signal circuits and connects ground through resistance 326 to brush 301 to transmit a reorder signal to any finder of that group which may have just attempted to seize the position. Since the senders of unit C do not receive an office indication, the double ground pulse is not necessary.

What is claimed is:

1. In a telephone system, trunks terminating at a single office, trunks terminating at a plurality of offices, operators' positions common to said terminating offices, means to connect said positions to said trunks, and means in said operators' positions for indicating whether a connected trunk terminates in one office or in a plurality of offices.
2. In a telephone system, trunks terminating at a single office, trunks terminating at a plurality of offices, operators' positions, means to interconnect said positions over one of said trunks, and means in one of said operators' positions for giving an indication to the operators at both of said positions whether said trunk terminates in one office or in a plurality of offices.
3. In a telephone system, trunks terminating at a single office, trunks terminating at a plurality of offices, operators' positions, means to interconnect said positions over one of said trunks, means in one of said operators' positions normally effective to generate two short pulses of tone, and means in said one position operated if said positions are interconnected over a trunk terminating at a plurality of offices to generate a single long tone pulse.
4. In a telephone system, trunks terminating at a single office, trunks terminating at a plurality of offices, operators' positions, means to interconnect said positions over one of said trunks, a series of relays in one of said operators' positions, means to successively operate said relays to transmit two short pulses of tone over said trunk, and means in said one position, operated if said trunk terminates at a plurality of offices to render ineffective certain of said series of

relays in order to transmit a prolonged tone over said trunk.

5. In a telephone system, a first group of trunks terminating at a single office, a second group of trunks terminating at a plurality of offices, operators' positions, means normally effective to connect said positions to any one of said trunks, means in said operators' positions for giving an indication as to whether said trunk terminates in one office or in a plurality of offices, and means to render one of said operators' positions available only to trunks of a particular group.

6. In a telephone system, a first group of trunks terminating at a single office, a second group of trunks terminating at a plurality of offices, operators' positions, means normally effective to connect said positions to any one of said trunks, means in said operators' positions for giving an indication as to whether said trunk terminates in one office or in a plurality of offices, and means to prevent the connection of one of said operators' positions to trunks of a particular group.

7. In a telephone system, a first group of trunks terminating at a single office, a second group of trunks terminating at a plurality of offices, operators' positions, means normally effective to connect said positions to any one of said trunks, means in said operators' positions for giving an indication as to whether said trunk terminates in one office or in a plurality of offices, means to render one of said operators' positions available only to trunks of a particular group, and means to give a reorder signal to a connected trunk of the other group.

8. In a telephone system, a first group of trunks terminating at a single office, a second group of trunks terminating at a plurality of offices, operators' positions, means normally effective to connect said positions to any one of said trunks, means in said operators' positions for giving an indication as to whether said trunk terminates in one office or in a plurality of offices, means to prevent the connection of one of said operators' positions to trunks of a particular group, and means to give a reorder signal to a trunk of said particular group attempting a connection with said position.

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